

AUGUST 1, 1921

Issued Weekly

FILE

PRICE 15 CENTS

# AVIATION AND AIRCRAFT JOURNAL



Aircraft Bombs Hitting Alongside the Armored Cruise Frankfurt

VOLUME XI  
Number 5

## SPECIAL FEATURES

HOW AIRCRAFT BOMBS SANK THE OSTFRIESLAND  
WHAT GENERAL MITCHELL CLAIMED  
COMMERCIAL AVIATION IN GERMANY  
FIAT 10-PASSENGER AIRPLANE  
THE PSYCHOLOGY OF PASSENGER CARRYING

Four  
Dollars  
a Year

RECEIVED

AUG 5 1921

FIELD OFFICERS SCHOOL  
LANGLEY FIELD, VA.

THE GARDNER, MOFFAT CO., INC.  
HIGHLAND, N. Y.  
225 FOURTH AVENUE, NEW YORK

Entered as Second Class Matter, Nov. 22, 1910, at the Post Office at Highland, N. Y.

# SPEED

Does it mean anything to you to save time?

Why do you travel by motor-car rather than by horse and buggy?  
Why the telephone?

Have you in mind a city which you visit often? Some city, say, only two hundred miles distant on the map, but eight or ten hours away by smelly train that runs very seldom and always at just the wrong time. And the roads are always bad just when you want to go by automobile, having missed the train.

The next time such a trip makes you downright disgusted with life: - Imagine yourself "hopping over" in an hour or two, leaving when most convenient, and enjoying an invigorating sight-seeing trip.

Of course landing fields at both ends are required; but we must wake up to the fact that landing fields are infinitely cheaper, and are of proportionately much more direct advantage to the city in each case, than connecting rail - or auto - roads.

Air travel is coming. It is fundamental that any vehicle which permits material saving in time of transportation must eventually become an economic necessity.

Don't let other towns profit by air travel at your expense simply because your particular town will not prepare for it.

*Vote for Your Municipal Landing Field*

## DAYTON WRIGHT COMPANY



DAYTON, OHIO



*"The birthplace of the airplane"*



## DISTRIBUTORS OF THE PRODUCTS OF THE CURTISS AEROPLANE & MOTOR CORPORATION:

### THE STATE OF ILLINOIS

Branch Sales Office of the parent corp.

### THE STATE OF MICHIGAN EXCEPTING THE UPPER PENINSULA

### WEST OF THE STATE OF OHIO

### THE STATE OF IOWA

### WEST OF THE STATE OF MISSOURI

### THE STATE OF INDIANA

### WEST OF ALABAMA AND GEORGIA

### THE STATES OF OREGON, WASHINGTON & IDAHO

### THE STATES OF VIRGINIA & NORTH CAROLINA

### THE STATES OF PENNSYLVANIA AND NORTHERN CALIFORNIA

### THE STATE OF MONTANA

### THE STATE OF WISCONSIN AND UPPER PENINSULA OF MICHIGAN

### THE STATES OF NEW MEXICO, UTAH, WYOMING, AND COLORADO

### THE STATES OF PENNSYLVANIA, MARYLAND, DELAWARE & SOUTHERN NEW JERSEY

### THE STATES OF MINNESOTA, THE DAKOTAS, AND MONTANA

### THE STATE OF KANSAS AND PART OF MISSOURI

### THE NEW ENGLAND STATES

### THE STATES OF TEXAS, OKLAHOMA, AND UNINCORPORATED TERRITORIES

### ALL COUNTRIES OF SOUTH AMERICA

### Curtiss Associates & Motor Corporation

30 North Michigan Ave., Chicago, Ill.

### Thompson Airplane Company

1000 Woodward Ave., Detroit, Mich.

### May J. Leary

110 Superior Ave., W. W., Cleveland, Ohio.

### Curtiss Iowa Aircraft Corporation

First Design, Iowa.

### St. Louis-Curtiss Airplane Company

1001 Third Ave., St. Louis, Missouri.

### Curtiss Indiana Company

Kokomo, Indiana.

### Curtiss Road Airplane Company

Montgomery, Alabama.

### Oregon, Washington & Idaho Company

1000 First St., Portland, Ore.

### Lynchburg Air Service Co.

1001 West Side, Lynchburg, Virginia.

### Earl F. Cooper Airplane & Motor Corporation

1001 S. 10th St., San Francisco, Calif.

### Grand Island Aero Company

Grand Island, Nebraska.

### Curtiss Wisconsin Airplane Company

100 Wisconsin St., Milwaukee, Wis.

### Curtiss Pennsylvania Airplane Company

1001 North 10th St., Harrisburg, Pa.

### Curtiss Kansas Airplane Company

1001 S. 10th St., Philadelphia, Pa.

### Curtiss Northwest Airplane Company

1001 Washington St., Minneapolis, Minn.

### Williams & Hill Airplane Company

Arkansas City, Kansas.

### Curtiss New England Airplane Company

Curtiss Corp., Long Island, N. Y.

### Curtiss Aircraft Corporation

Curtiss Corp., Long Island, N. Y.

### Curtiss Aircraft Corporation

Curtiss Corp., Long Island, N. Y.

## DEALERS

### THE STATES OF MASSACHUSETTS AND RHODE ISLAND

### PARTS OF THE CAROLINAS

### Lynchburg Aerial Transportation Company

7 Central Street, Lynchburg, Va.

### H. L. Browne Company

1001 S. 10th St., Charleston, N. C.



L. D. GAMBER  
PRESIDENT  
W. D. MURPHY  
VICE-PRESIDENT  
W. J. STANLEY  
TREASURER  
GEORGE NEWBLE  
MANAGING EDITOR

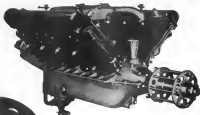
# AVIATION AND AIRCRAFT JOURNAL

LAMAR L'ORCY  
EDITOR  
ALFRED KLEIN  
ASSISTANT EDITOR  
EDWARD F. WALKER  
BARRY H. UHLEN  
CONTRIBUTING EDITOR

Vol. 33

AUGUST 1, 1921

No. 8



The identification of  
Incomparable Service

**FROM** now on all WRIGHT engines will have this nameplate on the hub. This is a valuable guarantee to all who fly with the engine that it was made by us in our own plant. This plate certifies that every ounce of material was critically examined, then machined by our own experienced men to exact gauge and carefully assembled. The nameplate guarantees the engine has passed our exacting running test requirements. While we are building aircraft engines this vigilance will never be relaxed.

The most exacting requirements for aircraft engines are fulfilled in the new models of Wright engines now in production and being sold.

#### ENGINE REQUIREMENTS RESULT IN PLANE OPERATIONS

1. Lightness per horsepower
2. High power
3. Low fuel consumption
4. Short overall length
5. Incomparable price
6. Longevity

#### Reliability

The risk in WRIGHT engines is reduced to the life of the flyer. They running quietly and run requirements. Safe, accurate and unerring vigilance make them engines the most reliable in the world.

Compare the characteristics of your own engine now in production with any engine built—foreign or domestic.

	WRIGHT 16	WRIGHT 24
Power at 1500 R.P.M.	150 H.P.	240 H.P.
Weight, dry with tank	150 lbs.	240 lbs.
Overall length, including tank and wing	4' 10"	4' 10"

NOTE:—The power given is the mean rated power, many individual engines give higher power and lower consumption.

WRIGHT AERONAUTICAL CORPORATION  
FAYETTEVILLE, N. J.

# WRIGHT AERONAUTICAL ENGINES

STANDARD MOTIVE POWER FOR ALL AIRCRAFT

## "Don't Give up the Ship"—Protect It

**A**LL those whose interest in National Aviation is tempered by a broad conception of National Defense will hesitate to draw too definite conclusions from the recent bombing tests. As the Navy has repeatedly announced, the experiments had the prime purpose to secure information about naval defense. The incidental feature of the accuracy of bomb dropping could have been ascertained at any time without a 300-mile flight over water. The reliability of aircraft and engines has been known for a long time.

What then has been learned about naval defenses from the tests of the Virginia Capes? The finding of one unexploded bomb on the deck of the ex-Offshoreland after the ship had been bombed by F-3-3, flying boats, and the scattering of that sixteen out of forty bombs dropped during an test were "hits," will cause the public to question seriously the efficacy of the naval aircraft bombs. The percentage of "hits" in the case of Army bombs was practically negligible, none being recorded with the larger bombs. If nothing more was learned from the tests than the fact that naval aircraft bombs require a new face the tests would have been worth while.

It was rumored that some of the bombs used were of English manufacture, being war surplus equipment which the Navy was glad to dispose of. However that may be, to leave the Secretaries of War and Navy, and a distinguished party of Congressmen to use "dud" bombs dropped reflects little credit on the Navy's preparation. If one out of sixteen hits in a ship failed to explode in war time the whole nation would demand an impartial investigation into such equipment.

While the bombing accuracy of both naval and Army fliers showed that they were well trained and that they could hit well targets both stationary and moving, it is in early to draw too positive conclusions as to the effects that could be obtained in an attack under service conditions on a well protected fleet. From the only really effective defense against aircraft attack, prompt aviation property directed, the results might have been quite different. On the other hand, again, the situation might have been totally changed in favor of the attacking side. But the latter operated as they would in time of war—with gas bombs and torpedoes in addition to and in advance of the fragmentation and demolition bombs that were actually employed in the tests. Had such a complete test been adequately conducted the whole country might have been appalled had beyond the started surprise it now experiences.

So far as the tests bearing a bearing on the outworn use of the common value of the battleship as the backbone of a well protected fleet, there is a distinct danger that too much will be made of them on the assumption that the tests will "be done of the costly battleships." It is probable that any such constructive work will have advanced from the tests that time built by small sized bombs would have made superior results. But the ex-Offshoreland and the ex-Offshoreland in the bottom out as the result of direct hits but of bombs drop-

ped alongside of them. This contention of General Mitchell's was probably disputed more than any other, and its being borne out by the tests becomes the most important fact established by the bombing experiments.

Already the disconcerting advance are using the result of the bombing tests as another argument for a decrease in naval preparedness, which in their eyes means principally the scrapping of "costly battleships." Nothing could be more dangerous. So long as this country is as defenseless in the air as it is today, and so long as no other country has a larger air force, our navy is our first line of defense and the protector of our international relations. Aircraft advances can do no greater service to National Defense than keeping these facts clearly in mind. Naval aviation should be placed in the hands of those who are willing and able to develop the aerial arm of the fleet unhampered by tradition and unopposed by historical precedents.

The Navy faces today a more serious problem than most of its officers realize. It is not only the development of the vastness of Naval Aviation, that is up for discussion, the bombs that sank the ex-Offshoreland also open the question of making our battleships invulnerable against aircraft bombs and torpedoes—if it can be done.

## Long Nonstop Flights

**T**HE recent attempt at a non-stop flight across the greater width of the United States—which was deflated by unfavorable atmospheric conditions—brings up the question whether such performances possess practical value. With all the support due to the hardwork of pilots who undertake such flights, we cannot see what useful and is served by non-stop flights of several thousand miles.

Aviation has passed that stage of its development where spectacular long distance flights were needed to impress the public with the possibilities of unbroken flight. Today it is no longer necessary to demonstrate that a specially equipped airplane can, given favorable weather conditions, fly from the East to the Pacific without stopping en route. Such a flight after all, is merely a question of unusual endurance on the part of the pilot, or pilots, (trained that it also proves engine reliability if the flight succeeds, we have the reverse of the medal if the flight is deflated, though any man however independent of the month running of the power plant. The non-stopping public naturally jumps to the conclusion that the flight failed because of the unsatisfiability of the engine.

Lacking technical knowledge, the average reader does not know that in such flights the internal combustion engine is called upon to do work which would never be expected from an automobile or from a locomotive.

We believe that those engaged in aviation should seek to avoid public opinion toward a better understanding of the nature of flight by explaining the features of dependability and safety rather than by putting up new "records."

# Ostfriesland Sunk by 2000-lb. Aircraft Bombs

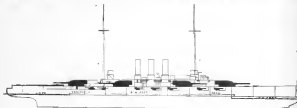
**Martin Bombers of Army Air Service Sink the 23,000-ton Battleship in Fourteen Minutes**

In the concluding phase of the bombing experiments conducted by the Army and Navy Air Service against warships of all types to determine the offensive power of aircraft the ex-German battleship *Ostfriesland* was sunk on July 21 by two 2000-lb. bombs dropped from Army Martin bombers. The dreadnaught had on the previous day been subjected to aerial bombardment with forty-one 250-lb. bombs and eleven 500-lb. bombs. Great damage was caused thereby to her superstructure, and some of her masts were set on fire, but on the morning of the 21st the *Ostfriesland* was seen to have gone down two feet by the stern. The two 2000-lb. bombs which were dropped upon her on the morning of the second day of the bombing tests fell farther apart than ever, for she was at least ten feet down by the stern when the final test began. The

In view of this point, which it is not intended to stress, the sinking of the *Ostfriesland* by means of five machine-gun-like bombs, each containing 1000 lb. of TNT assumes particular significance. The brevity of comment in which groups of air officers and aircraft men indulged after the bombing tests was awarded by General Williams, Chief of Ordnance, U. S. Army, when he said:

"A Bomb was Fired Today . . ."

"A bomb was fired today that will be heard around the world. It is a heavier explosive charge than has ever been delivered against a battleship. Its sinking of the *Ostfriesland* means that the capital ship now floats a new menace that must be guarded against by every possible study and effort.



Ostfriesland Profile of War Ex-German Battleship Ostfriesland, Protection 1000 lb. (1000 lb. of TNT) Main Gun and Turrets 32", Corbets 1000 lb. (1000 lb. of TNT) PROTECTIVE DECK, OF 1000 lb. 3"

2000-lb. bombs did their work quickly, for the 23,000-ton battleship went down fourteen minutes after the first of the two final bombs struck the water.

There was unanimous conviction of the staidness of naval warfare who maintained that even the heaviest and most powerful modern weapons would be spent by aircraft bombs provided the latter contained a sufficient quantity of explosive.

While the previous destruction of the *Ostfriesland* afforded a glimpse, a destroyer and an armored cruiser proved the vulnerability of unprotected or inadequately armored vessels to aerial attack, particularly every naval officer desired that a capital ship could be sunk by aircraft bombs. The proof to the officers was that the destruction of the *Ostfriesland* afforded a particularly instructive warning to the fact that the ship is a platform possessed of complete underwater protection. General naval designs of the latter years has been not only for the aerial menace in which this question had been studied and solved. Admiral Sir John Jellicoe in his book "The Grand Fleet" assumes on this point in connection with the battle of Jutland, where the British met a number of German battleships in sinking condition and reported them as probable losses. The German report on the battle acknowledged a much smaller number of losses than that pronounced by the British command, and the truth of their assertion was borne out when the armament when the ships assumed to have been sunk were found in German harbors. The answer to the question was that the complete underwater protection of the German battleships kept them afloat long enough to reach home waters.

"The biggest mine exploded against battleships weighs 500 lb., the biggest torpedo, 500 lb., the heaviest depth charge, 500 lb., and the biggest charge ever fired from a big gun was 1000 lb. fired from the big Ostfriesland experimental gun. Today we have used a 2000-lb. bomb, half of whose weight represented TNT explosive, dropped alongside a battleship after having been carried by an airplane 100 miles from base to set. The thing today was the carrying of a mine of its unprecedented size out that distance to land places and putting it down successfully. Stop and think what that means."

As Commander Chatham, British air attaché at Washington, D. C. voiced General Williams' views by saying:

"My only comment is that this shot will ring around the world. That's been said before, but it's true."

## First Day of Bombing

The bombing tests with the *Ostfriesland* began on July 20, when the vessel, which was anchored some 50 miles off the Virginia Coast, was subjected to aerial attacks first with 250-lb. bombs and then with 500-lb. bombs. The lighter bombs were used by naval F-5-L airplanes and Marine Corps DH-4B land machines, while the Army, using Martin bombers, dropped the 500-lb. bombs. General Mitchell, believing that the information needed in the bombing of the Frankfurt had sufficiently shown the damage that could be done by lighter bombs, withdrew from the light bombing tests of the *Ostfriesland*. A together forty-one 250-lb. aerial bombs and eleven 500-lb. Army bombs were dropped on the target ship. There

were several duds, but nine of these were "buds" which failed to explode on hitting the ship. The naval bombs had a particularly large percentage of duds.

The attack was opened at 1:30 p.m. by a division of five Marine Corps DH-4B land machines which, after dropping a smoke bomb for ranging purposes, released nine 250-lb. bombs in four attacks. One direct hit was scored off of the mainmast, where damage was done to the foremast. Five bombs were duds.

At 2:00 p.m. the Second Division of naval F-5-L airplanes arrived on the scene and dropped seven 250-lb. bombs, one of which hit off of the bow's going head damage. Five of the bombs dropped were duds. At 3:30 o'clock the *Ostfriesland* had taken a decided list to port, apparently as the result of the direct hit scored by one of the F-5-L airplanes. The Fourth Division of F-5-Ls then attacked the target and dropped eleven more 250-lb. bombs with varying success. Many

when the bombs drew away from the last bomb, which hit the stern at 4:37. In this series of bombs there was again a number of duds.

Although the observers' board which examined the *Ostfriesland* after the bombing announced that there had been no serious damage to the vessel, some of the bombs which exploded close to her bow and stern eventually proved more effective than had been thought at first. The following morning, July 21, the *Ostfriesland* was found to have gone down two feet by her stern during the night and examination showed that there had developed opening in the underwater keels, through which the ship was slowly taking in water. The naval officers stated that had the duds been working this water could have been taken care of easily.

## The Second Day of Bombing

The second series of bombing tests against the *Ostfriesland*



EX-GERMAN BATTLESHIP OSTFRIESLAND SUNK BY ARMY MARTIN BOMBERS ON JULY 21

of these were duds, but two bombs, hitting off the stern would probably have put the steering gear out of commission or damaged the propellers.

At 2:40 p.m. the Army Martin bombers arrived overhead and were kept in the air waiting for fifty minutes while the Navy's machine gunners, working the Observers' Board, dropped alongside the *Ostfriesland* and examined the effect of the bombs that hit the vessel. The result was that local damage had been caused, but that the vessel was not seriously damaged.

At 3:30 the bombing tests were resumed when the Martin bombers dropped eleven 500-lb. bombs. By then it had become evident to General Mitchell that the small bombs employed could not prove the armored decks of the *Ostfriesland* and the Army fleet was therefore given orders to drop these bombs near enough to the ship to cause her masts to open through the underwater explosion. This the Martin bombers provided to do with great accuracy, for they placed three bombs just off the bow and two off the stern, and made one direct hit. While the Martin bombers were dropping their bombs another division of F-5-L flying boats appeared and dropped a dozen 250-lb. bombs, scoring two direct hits while several bombs dropped right off the bow or stern. Nevertheless the *Ostfriesland* did not appear to be more than locally damaged

excepted two planes' an early morning attack by Army Martin bombers dropping 1200-lb. bombs, and a midday attack in which one Martin bomber and one Handley-Page of the Army Air Service dropped 3000-lb. bombs and finally sank the ship.

Considerable damage to the superstructure of the ship was done in the morning attack, when the Army Martin bombers scored three direct hits out of five bombs dropped. This amount of five, 80 per cent, was the best in all the tests. The five machines arrived on the scene at 6:25 a.m. and seven minutes later four small range-finding bombs were let loose. At 8:35 the Martins, in single column, fired the target and dropped five of the twelve 1200-lb. bombs which they carried. Having scored three direct hits, the Army fleet was ordered to cease bombing at 8:50 by the Observers' Board, which ruled that enough direct hits had been made to warrant calling off the rest of the 1200-lb. bombing test. The Martin bombers then returned to Langley Field, dropping the remainder of their bombs in the air to insure their three exact.

The first direct hit with the 1200-lb. bomb was on the starboard side of the foremast deck and took a huge hole out of her side. The second bomb fell in the water 125 ft. off the port bow, but the third bomb hit the ship on the starboard bow





GROUP PICTURE OF THE ARMY AIR SERVICE OFFICERS WHO MADE THE ENSIGNMAN'S WOODEN FORMATION BOX COME ALIVE WITH AIRCRAFT BOMBS

**300 lb. Ensignman's Bomb (Fig. 2)**  
 Approximate Weight ..... 500 lb.  
 Explosive Charge ..... 50 per cent  
 Overall Length ..... 5 ft. 3 in.  
 Maximum Diameter ..... 34 in.

The bomb is equipped with nose and tail fuse capable of maintaining or delay action.

The threaded casing at the nose permits the expansion and destruction of medium size of permanent buildings, light fortifications and small vessels without deck armor.

The suspension legs are spaced 14 in. apart on the body of the bomb, one on the nose casing and one on the thicker rear casing.

The four tail fins are braced for rigidity by inter-mounting pin brims. The one foot scale gives an idea of the size of this bomb.

**300 lb. Ensignman's Bomb (Fig. 3)**  
 Approximate Weight ..... 2000 lb.  
 Explosive Charge ..... 50 per cent  
 Overall Length ..... 11 ft. 4 in.  
 Maximum Diameter ..... 39 1/2 in.

Nose and tail fuses assure the function of the bomb with or without delay.

The nose casing is designed to penetrate light deck armor of naval craft, reinforced concrete structures and the bomb is used whenever the maximum of destructive blast is required.

The bomb has no suspension legs and is carried by a steel strap passed under the cylindrical body at its center of gravity.

The four tail fins are braced in two groups and are firmly joined all of the distance hole for the tail fuse among them to form a cone.

**1100 lb. Ensignman's Bomb (Fig. 3)**  
 Approximate Weight ..... 1200 lb.  
 Explosive Charge ..... 50 per cent  
 Overall Length ..... 5 ft. 11 in.  
 Maximum Diameter ..... 21 in.

This bomb like the others is equipped with nose and tail fuses.

The casing is of sufficient strength and the explosive charge is large enough for the attack of major fortifications, concrete buildings, steel structures and naval craft. It is not designed to penetrate armored decks.

This is the largest bomb equipped with suspension legs, 14 in. apart, for carrying purposes.

The four tail fins are braced for rigidity and to prevent damage in descent.

**1100 lb. Ensignman's Bomb (Fig. 3)**  
 Approximate Weight ..... 1300 lb.  
 Explosive Charge ..... 50 per cent  
 Overall Length ..... 6 ft. 5 in.  
 Maximum Diameter ..... 21 in.

The bomb is equipped with tail fuse only and is general in its use with delay action.

The casing is throughout very light, to meet weight with the most ranging targets. It will meet any point the point of the nose impact. It is used only when Ensignman's Bombs have not done enough work to penetrate.

Two suspension legs are secured to the bomb 14 in. apart for carrying.

The fin assembly has four tail fins of 30 deg., braced from each other near their leading edges.

The type of bomb depends principally on fragments for the damage inflicted after explosion, rather than on blast.

#### Weather Information

Beginning June 13, 1931, a systematic broadcasting of wind and weather forecasts, storms, and hurricane warnings and weather information was begun from the naval radio stations at Portland, Me.; Boston, Mass.; Philadelphia, Pa.; Baltimore, Md.; Norfolk, Va.; Charleston, S. C.; New Orleans, La.; Jacksonville, Fla.; St. Augustine, Fla.; Miami, Fla.; St. Petersburg, Fla.; Panama, Fla.; New Orleans, La.; Albany, N.Y.; Buffalo, N. Y.; Cleveland, Ohio; Chicago, Ill.; Duluth, Minn.; Port au Prince, Haiti; San Juan, P. R.; St. Thomas, V. I. and St. Cruz, V. I.

This information is out daily on regular schedule indicated for each station. A circular, dated May 28, 1931, has been issued by the Weather Bureau showing the naval radio stations from which the distribution is made, transmitting wavelengths, call letters, information broadcast therefrom, hours of distribution, and the Weather Bureau stations from which the forecasts and weather information are supplied. Names—Codes of the circular can be obtained in reference to it in "Weather Bureau at Washington" or to any of its stations on the Atlantic and Gulf coasts and the Great Lakes and from San Juan, P. R.

## What General Mitchell Claimed

The following are extracts from the testimony of Brig. Gen. H. H. Mitchell, Assistant Chief of Air Service, before the U. S. Committee on Naval Affairs, given last February. On May 13 it is the right of the present bombing experiments with a village it is difficult to realize that the claims should be the first have been characterized as those of a fanatic—warrior.

We have contemplated the use of gas in the attack on a village, but, although we have had no tests of that yet, we think we can do more with explosive bombs. However, everyone at a battery will tend to want gas tanks, and otherwise protect themselves.

Against the air and gas, an explosive bomb, we think, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

For in an emergency, a general principle, we can do more with explosive bombs than any other weapon against the village, at present I will not say why. The first half of the village is destroyed by the first explosion, so that the first half of the village is destroyed by the first explosion.

harmless. If explosion comes forward of bags (that part of the ship fitted with longitudinal protection hulls), it will cause her to settle by the bow, causing her to decrease speed, to starboard, and consequently to fall out of formation. If explosion comes aft of bags, the after compartment will sink, causing ship to settle by the stern, the main propeller shafts will be thrown out of line, causing almost immediate stopping of engines on that side of ship, consequent steering down, and inability to keep station in formation. In addition, there is a strong possibility that the middle will become jammed at the cross line, making the ship a menace to the ship behind her.

If an explosion occurs ahead of the bow (or amidships) and does not cause the ship to sink, it will at least cause the ship to lose a sharp bow, causing difficulties in steering and consequently serious trouble in a turning position in formation. It will also cause a marked change (increase or decrease) in the angle of elevation of the main battery guns, which will greatly decrease accuracy of gunfire.

The explosive bomb is the second line of defense, and here the air and weight are dependent on the size of the explosion that is designed to carry it. The biggest explosion now under consideration is designed to hit about 5,000 pounds, in addition to that the present explosive bomb will lift from 1,500 pounds to a ton.

The third class of weapon we have is the gas. We have no gas used in this country, the 30-caliber machine gun, the 45-caliber, the 11-caliber, that is used in Europe, the 20-caliber, the 11-caliber, the 11-caliber, the 11-caliber. The point I want to make about this is that in the development of the air force, it must be remembered that the action of an air force is primarily to destroy the action of an opposing force, and after you have secured the action of the air to a sufficient extent, then to bring a direct attack against the enemy in a way that he will feel it most. In carrying that attack, it must be necessary to let the action of a great distance. That is to say, it is easy to see attacking us and wished to destroy us, but most certainly we can let our enemies, if we were capable of doing it, in the Middle East, and all the way along our present position in the world. One valuable area in this country is in a sort of "T" shape, from Boston to Chesapeake Bay, and from New York to Chicago. If communication in that area were



BRIG. GEN. H. H. MITCHELL











## Trade Notes

Two interesting new devices which are manufactured by the American Instrument Co. of Washington, D. C., have just come to our attention. One is the Newell Check Valve Compensator Indicator. This was originally designed by Mr. F. D. Newell of the U. S. Bureau of Standards, to get an accurate measure of the maximum compressive or internal combustion stresses. This is obtained by a very sensitive needle which valve which opens at a pressure starts to decrease, lower showing the maximum pressure reading on the gauge.

The other device is a High Speed Pressure Indicator which consists essentially of three parts: a pressure balancing element, a timing element and a coordinating element.

(1) The pressure balancing element is the part communicating with the engine cylinder and is used to balance the cylinder pressure by a compressible and measureable static gas pressure and to indicate electrically when this condition of balance exists.

(2) The timing element which is fastened to a revolving part of the engine contains a revolving contact of one degree division and a brush which can be set at any selected position on the scale and is used to close the indicator circuit at a predetermined instant. It has incorporated into its construction, a sliding spark gap to be connected in series with the firing circuit by which the angular position of the firing spark can be located and with which interesting data on firing system may be obtained.

(3) The coordinating unit consists of two parts, (a) the electric circuit, and (b) the pressure circuit. The former is made up of a series combination of battery, telephone receiver, lever, and indicator. The latter consists of a series of gas under pressure and a source of partial vacuum with valves and gauges for supplying, controlling and monitoring the balancing pressure.

This indicator is now being used successfully in the test laboratories of many of the automotive factories and educational institutions throughout the country. Complete descriptions of the two above mentioned devices may be obtained in pamphlets issued by the company.

## Flexible Fuel Pipes

Through no doubt permanently fixed metal piping for gasoline and oil systems in aircraft is preferable to copper piping, nevertheless metal piping of any kind is liable to fracture by vibration, or to damage by service work, or by accident, when work is being done on other parts of the machine. Obviously flexible piping is preferable to any kind of rigid piping if a satisfactory flexible pipe which is gasoline, oil and water proof can be had.

Heretofore the right kind of pipe has been lacking—at any rate since the Bendix flexible pipe was abandoned—or else, where a satisfactory pipe has been found it has been impossible to discover a trustworthy man for it. These difficulties seem to have been overcome by the Standard Patent-Tube Co. Ltd. of England.

The pipe itself is composed of an inner layer of gut—either pig, ox, or horse—covered by asbestos and protected from external pressure by wire winding. Animal gut is found to be proof against gasoline, oil, and water. Copper is the best strengthening material, and wire is the best anti-crack material.

## Educating the Public

The following news item, which appeared in the Harrisburg, Pa., Telegraph, does not require any comment: Middleburg, Pa., July 7.—The large airplane which arrived at the Aviation Station on Tuesday from Langley Field, Va., left yesterday afternoon on the same trip. The machine is a Martin-Baker type. It has two engines and seats twelve persons. When it arrived here it arrived as new. The large plane was accompanied here by smaller machines, also of Martin-Baker make. The large machine is a new plane. It returned to Langley Field with a supply of airplane goods. The machine measures seventy-two feet from wing to wing and is 100 feet long.

# Where to Fly

## CALIFORNIA

SAN FRANCISCO, CALIFORNIA  
EARL P. COOPER AIRPLANE & MOTOR CO.

## ILLINOIS

CHECKERBOARD AIRPLANE SERVICE  
FOREST PARK, ILLINOIS

## INDIANA

One of the largest and best equipped flying fields in the United States  
CURTISS-INDIANA COMPANY  
ALL TYPES OF CURTISS PLANE

## LOUISIANA

GULF STATES AIRCRAFT COMPANY  
SHREVEPORT, LA.

## MASSACHUSETTS

BOSTON AND SPRINGFIELD, MASS.  
EASTERN AIRCRAFT CORP.  
345 FIRST ST., BOSTON, MASS.

## MINNESOTA

WHITE BEAR LAKE, MINN.  
The Twin Cities, short commercial route.  
Harold C. Friesley Aircraft Company  
SCHOOL OF AVIATION

## NEW YORK

AEROMARINE AIRWAYS, INC.  
Times Building, New York  
31 Passenger Flying Cruisers — 5 passenger, open and enclosed flying boats. — Lightning Tours — Flights to Coast and Lake Resorts

## NEW YORK

CURTIS FIELD, GREENE CITY, LONG ISLAND  
CURLWORTH FIELD, BEAUFORT, N. C.  
FLYING STATION, ATLANTIC CITY, N. J.  
CURTISS AIRCRAFT & MOTOR CORPORATION

## OHIO

DAYTON, OHIO.  
Stuyvesant, Dayton, Street and Field — Mile from Dayton Station.  
JOHNSON AIRPLANE & SUPPLY CO.

## OREGON

LAND OR WATER FLYING  
DESIGN, WASHINGTON AND ISLAND AIRPLANE COMPANY  
PORTLAND, OREGON

## PENNSYLVANIA

Public School and Commercial Airplane  
Sole for Capital  
Official Flying Field Area City of Philadelphia  
PHILADELPHIA AERO-SERVICE CORPORATION  
426 East State Street Building, Philadelphia.

## WISCONSIN

CURTIS-WISCONSIN AIRCRAFT CO.  
FLYING SCHOOL  
Madison, Wis. Post  
GILLES I. WISCONSIN

## WISCONSIN

See Chicago Record  
If you are one of the companies in your state having lost  
and looking for passenger carrying, club, training and  
special flights, you should be represented in WHERE TO FLY  
each week.

26 Consecutive Insertions \$30.00



Photo Shows by  
Aerobically, Maximum High

## The Friesley Falcon—

One of the finest of our modern Airliners is the Friesley "Falcon." Built specially for passenger service, the "Falcon" carries twelve passengers and baggage in her comfortably furnished and enclosed cabin, at a speed of 120 miles an hour.

Mr. B. M. Spencer, designer and builder of the "Falcon," writes: "..... when the question of varnish came up there was no hesitation as to what to use. Valspar is used by preference on all our ships and always has given complete satisfaction. Due to the fact that the ship was constructed under the worst possible conditions—heavy rains and in a building exposed to the weather—the behavior of Valspar was simply wonderful."

Today Valspar is everywhere recognized as the ideal varnish for airplane use. Valspar is proof against weather, water and wear—against rain and sun, oil, gasoline and grease. And it is so wonderfully elastic and tough that the severest vibration will never cause it to crack.



**VALENTINE'S  
VALSPAR**

The Varnish That Won't Turn White

**VALENTINE & COMPANY**

Largest Manufacturers of High-grade Varnishes in the World  
ESTABLISHED 1870

New York Chicago Boston  
London Paris Amsterdam  
W. F. FULLER & CO., Pacific Coast

# BOEING AIRPLANE COMPANY

*Manufacturers of*

**EXCLUSIVELY DESIGNED**

**SEAPLANES  
FLYING BOATS  
AIRPLANES**

CONTRACTORS TO UNITED  
STATES GOVERNMENT

GEORGETOWN STATION  
SEATTLE WASHINGTON

Member of the Manufacturers Aircraft Association



## The Laird Swallow

*America's First Commercial Airplane*

EXPERIENCED pilots note at once from the specifications of the Laird "Swallow" its remarkably light weight, low horse-power and small dimensions, as compared with its large carrying capacity and proved splendid performance. The resultant low operating cost is the goal of every company or individual operating airplane passenger or freight for profit. "Swallow" Distributor Finckham are paying well - none yet to be awarded.

### E. M. LAIRD COMPANY

MANUFACTURERS

WICHITA, KANSAS

General Sales Office

2214 SO. MICHIGAN AVE., CHICAGO.

A. M. LAIRD COMPANY  
and Co. MICHIGAN AVE., Chicago, Ill.  
Phone and the independent a copy of  
over now located on the Laird "Swallow"  
Name  
Address



THE EARLY BIRD (1913-14)

OUR AIRPLANES ARE PRODUCED BY MEN EXPERIENCED IN THE DESIGN AND CONSTRUCTION OF COMMERCIAL AND WAR TIME AIRCRAFT OF ALL TYPES

Type	Weight Pw. Load	Empty Load	Motor	Speed of Motor and P.W.	Lim. mi. H.P.	Lim. mi. H.P.	Refill fuel oil water	Refill fuel oil water
ED-10	1000	0.5 tons 1175 lbs.	20 hp. Aronson	0.200 1000	20.0	0.5	\$2,000	\$1,750
ED-45	1800	0.8 or 1 ton 1800 lbs.	30 hp. Aronson	0.200 1000	20.0	0.5	\$2,000	\$1,750

**HUFF, DALAND & CO., INC.**  
OGDENSBURG, NEW YORK

AIRPLANES

FLYING BOATS

MOTOR BOATS

## Cox-Klemin Aircraft Corporation

Consulting, Designing & Constructing Engineers

College Point, Long Island, N. Y.

Flying 1809

has established a fully equipped plant for the experimental construction of aircraft

has taken over the engineering organization of Alexander Klemin & Associates

will undertake the design and construction of special airplanes of every type and for every purpose

will render consulting service to Transportation Companies in laying out airways and selecting ships

will re-build and repair airplanes of every type

## HEATH AIRPLANE CO., INC.

America's Oldest Aeronautical Supply House  
Est. 1898.

## Tremendous Cut in Prices

### FOR AUGUST

Dope	\$ 1.75
Airplane cloth	.30
Shock absorber	.30
Cable	2.75
Cable clamps	1.50
Standard J1 and JN fuel fittings, each	1.00
Tachometers	10.00
Propellers for Curtiss, Hall-Scott or Hupano	10.00

Send for our August Price List

## HEATH AIRPLANE CO., INC.

2856 Broadway, Chicago, Ill.

## AIRCRAFT YEAR BOOK 1921

Aeronautics—The most talked of  
element to-day in Commerce  
and national defence

[INTERNATIONAL Edition of the Aircraft Year Book put off the press—360 pages—275 text and reference data, 38 illustrations, 47 historical aircraft designs, maps, etc. This book tells you what you should know concerning flying in all its phases, transport of passengers and packages, mail, forest patrol, livery work, photography, world records, law, airports—military and aerial developments. The edition is limited. Sign and return the attached blank to-day. Published by MANUFACTURERS AIRCRAFT ASSOCIATION, INC. Fill in and return order blank with remittance

The GARDNER, MORTFAY CO.  
315 Fourth Ave., New York

Customers:

I enclose check (or) money order (please indicate which) for \$\_\_\_\_\_ for which please send me postpaid copy of the 1921 Aircraft Year Book at \$2.25 each, postpaid

(please print) Name \_\_\_\_\_  
Address \_\_\_\_\_

## INDEX TO ADVERTISERS

A	
Aero Import Corp.	151
Aeromarine Plane & Motor Corp.	154
Aircraft Material Equipment Corp.	154
Aircraft Service Bureau	150
American Airways	149

B	
B. G. Corporation	149
Boring Airplane Co.	144

C	
Cox-Klemin Aircraft Corp.	146
Curtiss Aeroplane & Motor Corp.	153

D	
Dayton Wright Co.	152
Duggan, Ralph C., Co.	149

F	
Fitch Manufacturing Co.	140

H	
Hall, Edward & Co., Inc.	145

L	
Laird, E. W., Co.	145

M	
Martin, The Glenn L., Co.	150

N	
Navy Department	147

R	
Rolling's, John A., Son's Co.	149

S	
Sperry, Lawrence, Aircraft Co., Inc.	145

T	
Thomas-Morse Aircraft Corp.	135

V	
Valentine & Co.	145

W	
Williamson, Beas & Co.	149
Wright Aircraft Corp.	142
Wright Aeronautical Corp.	126

## BUY IT FROM THE NAVY

### AERONAUTICAL EQUIPMENT

The following listed material is being sold by the Navy Department. The larger part of it is new and unused. This is a great opportunity. Take advantage of the low prices. Catalogs will be sent on request.

**AEROMARINE 39-B SEAPLANES**  
**CURTISS M F FLYING BOATS.**  
**STANDARD SCOUT AIRPLANES.**  
**BOEING SEAPLANES**  
**OVERHAULED BURGESSN-9 SEAPLANES**  
**MODEL F FLYING BOATS.**

### KITE BALLOONS

### LIBERTY ENGINES

**CURTISS "OX" 90 HP AND "OXX" 100 HP ENGINES**  
**CURTISS "DXX-6" 100 HP ENGINES**  
**CURTISS V-2, TEN 200 HP 8 CYLINDER ENGINES**  
**HALL-SCOTT A-7-A 100 HP 4 CYLINDER ENGINES**  
**GNOME 100 HP ENGINES**

**RADIATORS, VARIDUS TYPES \$5-\$15.**  
**TANKS, VARIDUS TYPES \$5-\$10.**  
**TACHIMETERS \$5.**  
**ALTIMETERS \$15-\$50.**  
**PROPELLERS \$5-\$15.**

**COMPLETE SETS CONTROL WIRES, VARIDUS TYPES 1/3 CDST**  
**AERPLANE FABRIC, COTTON AND LINEN**

## BUREAU OF SUPPLIES AND ACCOUNTS

NAVY DEPARTMENT WASHINGTON, D. C.

Sales Rooms Bldg. 176 Navy Yard

Washington, D. C.

## The President Has Announced

### A POLICY OF ENCOURAGEMENT OF MILITARY AND CIVIL AVIATION

There is now every reason to anticipate immediate progress in building up the Army, Navy, Postal and other Government air services. Large orders have already been placed. Civil aviation also will be fostered by national legislation and the development of landing fields and airways will have Government encouragement.

IT WILL PAY YOU TO KEEP CLOSELY IN TOUCH WITH THESE DEVELOPMENTS AND COMPLETE TECHNICAL DETAILS BY READING EACH WEEK THE RECOGNIZED AMERICAN AUTHORITY ON AERONAUTICS—

Sign the coupon now but do not send any money with it. We will send you the next two issues as they appear and bill you for a year's or six month's subscription, as you prefer. If, upon receipt of bill, you decide not to continue, advise us promptly and accept the two issues with our compliments.

## Aviation and Aircraft Journal

GARDNER, MOFFAT CO., INC.,  
225 Fourth Ave., New York.

Send me the next two weekly issues of AVIATION AND AIRCRAFT JOURNAL. If, upon receipt of bill for subscription as indicated below, I decide not to continue, I will so advise you, and understand that no charge will be made for the two copies.

One Year (52 issues)—U. S. \$4.00; Canada \$5.00; Foreign \$6.00  
Six Mos. (26 issues)—U. S. \$2.00; Canada \$2.50; Foreign \$3.00

Name

Address

### LEARN TO FLY!

IN CHICAGO WITH  
**THE RALPH C. DIGGINS CO.**  
YOU start flying in the morning. Complete instruction. From first flight. Complete course of instruction.  
Thorough ground course, including instruction in motors, instruments, navigation, emergency, flying, etc.  
PLANE RENTERS \$2000 Per Year and Up  
BEGGINS NOW!  
Write for literature and enrollment offer  
**THE RALPH C. DIGGINS CO.**  
Dept. 261 148 N. Dearborn Street Chicago, Ill.

### The Spark Plug That Cleans Itself

# B. G.

Contractors to the U. S. Army Air Service & the U. S. Navy

**THE B. G. CORPORATION**  
33 GOLD STREET  
NEW YORK CITY U. S. A.

## CANUCK

AND  
OX5 ENGINE SPARE PARTS  
IMMEDIATE DELIVERY  
CAL. PROPS. \$15 PARAGON PROPS. \$30  
ROME - TURNER RADIATORS \$20  
ALSO COMPLETE ASSORTMENT OF STANDARD UTILITY PARTS  
**GET OUR PRICES BEFORE ORDERING**  
AIRCRAFT MATERIALS & EQUIP. CORP.  
1885 SEDWICK AVE., NEW YORK CITY

### Flottorp Manufacturing Co. AIRCRAFT PROPELLERS Established 1923

213 Lyon St., Grand Rapids, Michigan

Contractors to United States Government

## Aerial Garage

THE AMERICAN AIRWAYS announce that their hangars, located on College Point, Flushing, (N. Y. City), are equipped to handle any kind of airplane or seaplane job of

OVERHAUL REPAIR  
CONSTRUCTION  
SALVAGING TESTING

and that a full supply of spares and materials is always to be had at reasonable prices.

For further information:  
Yonkers 4781 or  
Flushing 1888

**AMERICAN AIRWAYS**  
College Point, New York City  
W. G. Schuchman, Jr. Elmer D. McKee T. L. Tilden  
Operating: American Airways Training Schools  
for Air Mechanics and Pilots  
Expert Pilots and Mechanics on short notice

## ROEBLING

16 Wire Galvanized Aircraft Stand—Size 1/8" - 1/16"  
Standard Tension Aircraft Wire R & S 6-35  
8 x 7 (Cannon Center) Galvanized Aircraft Cord 1/2" - 1/16"  
7 x 1 (Wire Center) Galvanized Aircraft Cord 1/2" - 1/16"  
1 x 16 Tension Aircraft Cord 1/2" - 1/16"  
Standard Galvanized Steel Aircraft Thimbles 1/2" - 1/16"  
Standard Steel Aircraft Formulas R & S No. 6-13

**JOHN A. ROEBLING'S SONS COMPANY**  
TRENTON, NEW JERSEY.

### Wernick NON-TEAR Aero-Cloth

A SAFE CLOTH for FLYING

For Particulars Apply to  
**WELLINGTON SEARS & CO.**  
36 Worth Street, New York





# A Thousand to One

BUILT on what war taught—the Bentire plant of The Glenn L. Martin Company, in Cleveland, is planned for quick expansion at sudden call.

The Company laid out grounds—located buildings—designed special tools and trained its personnel—with one objective, rapid production of *quality* aircraft.

Every eight days, a finished Martin Bomber is turned out.

If war comes the Company can shortly reach a production of ten a day.

1000 Martin Bombers can be built for the cost of a modern battleship with its accessories.

What chance would one ship have against 1000 bombers?

What chance would a man armed with a rifle have, attacked by 1000 hornets each carrying a fatal sting?

*Think it over!*



THE GLENN L. MARTIN CO.  
CLEVELAND

Member of the Manufacturers Aircraft Association

